Two New Species of Hawaiian *Pseudosinella* (Collembola: Poduromorpha: Entomobryidae)[1]

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ABSTRACT

Two new species of the genus *Pseudosinella (P. lahainaensis* and *P. kalaluensis)* are described. A table is given comparing the four Hawaiian species of the genus.

Previous studies done with Hawaiian Collembola have not included descriptions or specific records of the genus *Pseudosinella* (the specimens identified as *P.* sp. (Bellinger & Christiansen, 1974) have been lost). In the course of a study of the Collembola of Hawaii, by P. Bellinger and K. Christiansen now in progress, four species of *Pseudosinella* have been uncovered. Two of them, *P. fujiokai* Yosii (1964) and *P. octopunctata* Borner (1901), have been previously described. Two new species, *P. lahainaensis* and *P. kalalauensis,* are described below.

P. fujiokai, the most common species, and *P. octopunctata* will be dealt with in the Collembola of Hawaii. They are probably introduced and they differ from the other two *Pseudosinella,* and from Hawaiian *Lepidocyrtus,* by the presence of an outstanding, truncate macrochaeta on the hind tibiotarsus. *P. lahainensis* is a marine littoral species with adaptations to this habitat which are unique among the species of the genus.

Table 1 summarizes the major features of the four species. The nature of the chaetotaxy features used is shown in Diagram 1. Fuller descriptions of these features can be seen in *The Collembola of North America.*

The "species formula" given in each description is based on that introduced by Christiansen, Gama and Bellinger, 1983. The characters used in that code are:

Code

Digit	*Code*
First:	Eye number (eyes per side).
Second:	Large outer (wing) tooth on unguiculus: present = 1; absent = 2.
Third:	Dorsal cephalic macrochaetea S and/or T present = 1; S and T absent = 2.
Fourth:	q_1 seta on dorsum of second abdominal segment: present and minute, unciliated = 1; developed as ciliated macrochaeta (Q) = 2; absent = 3.
Fifth:	Tenet hair: acuminate = 1; truncate or clavate = 2.
Sixth:	Labial triangle setae M_1, M_2, E, L_1, L_2: all present and ciliated = 1; one or more absent or smooth = 2.
Seventh:	Dorsal macrochaeta of fourth abdominal segment:
	P_1 absent, 2 M macrochaetae – 0 + 2 = 1
	P_1 present, 2 M macrochaetae – 1 + 2 = 2
	P_1 present, 3 M macrochaetae – 1 + 3 = 3
	P_1 absent, 3–4 M macrochaetae – 0 + 3 or 0 + 4 = 4
	P_1 absent, 1 M macrochaeta – 0 + 1 = 5

– means the condition is unknown.

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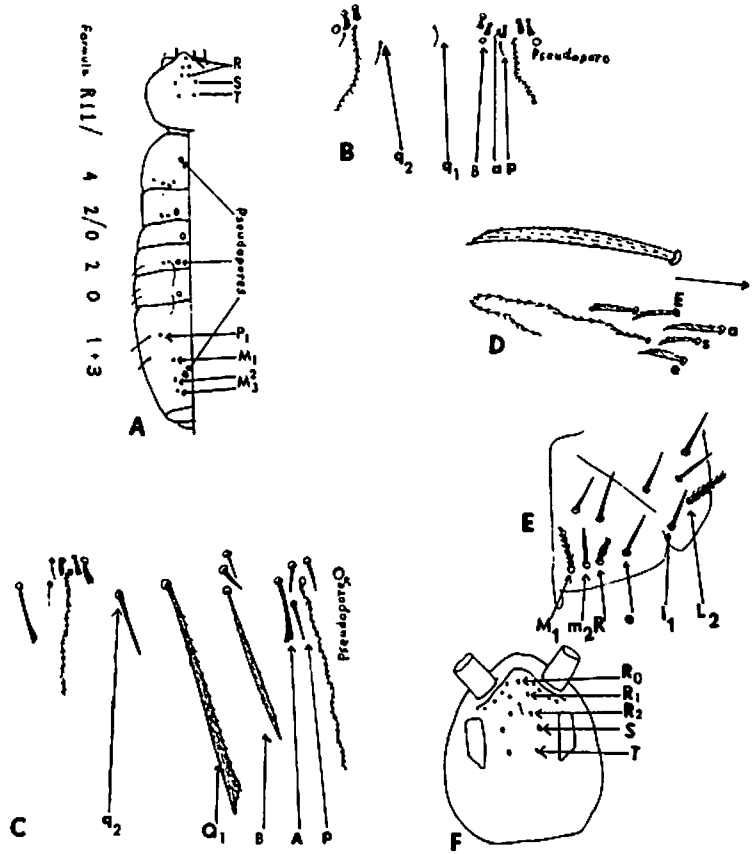


Legend to DIAGRAM 1. A) Diagrammatic dorsal chaetotaxy with formula at left. B) and C) Two different diagrammatic left side dorsal chaetotaxies of the second abdominal segment. In B) Q and B are macrochaetae, in C) microchaetae. D) Diagrammatic anterior bothriotrichial complex of right side, to show supplementary seta (e). E) Diagrammatic labial triangle of left side. F) Diagram of cephalic macrochaetae.

The seventh number of species formula developed by Christiansen, et al. (op. at.) has previously been defined only for numerals 1 through 4. Here, the numeral "5" is used to represent fourth abdominal chaetotaxy condition 0+1.

Pseudosinella lahainaensis n. sp.

Figures 1–8 and Table 2

Description — Color blue, with amount of pigmentation variable between specimens. When pigmentation is strong, it is strongest on head, thoracic segments, and fourth abdominal segment. Fourth antennal segment without apical bulb, and ovoid in shape. Subapical sense organ in a shallow pit, cylindrical, truncate or slightly expanded apically. Third antennal segment almost triangular, with broad end facing fourth segment. Second and first antennal segments subcylindrical. Apical organ of third antennal segment with thick, blunt sensory pegs. 4 eyes (rarely 5) per side. Head squarish to pentagonal. Prelabral setae 4–5–5–4 with only posterior row ciliated.

TABLE 1. Characters of Hawaiian species of *Pseudosinella*

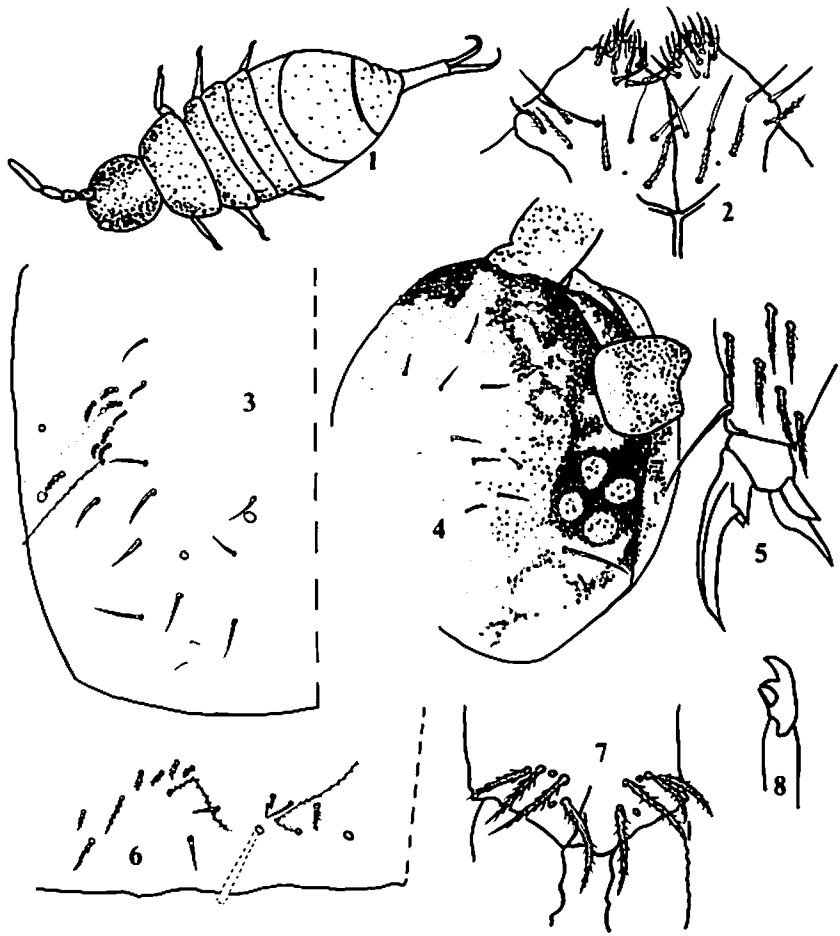
Species	Eyes per side	Tenent hair	Unguicular tooth	Manubrial Plaque	
				Inner	Outer
fujiokai	0	acuminate	+	2	1
octopunctata	4	clavate	–	2	1
lahainensis	4(5)	acuminate	+	2	2
kalalauensis	4	clavate	–	2	2(3)

	Chaetotaxy*																		
	Midcephalic Macrochaetae					Labial Triangle Setae						Thoracic Macrochaetae		Second Abd. Segment					Fourth Abd. Segment	
Species	R_0	R_1	R_2	S	T	M	M	r	E	L	L	II	III	p	a	b	q	q	P	M
fujiokai	+	+	+	–	–	–	M	vg	E	L	L	–	–	–	A	B	q	q	1	1
octopunctata	+	+	+	+	+	–	M	–	E	L	L	1	–	+	A	B	Q	q	1	2
lahainensis	+	+	–	–	–	–	M	vg	E	L	L	–	–	–	a	B	q	q	0	1
kalalauensis	+	–	–	+	+	M	M	r	E	L	L	–	–	–	a	b	q	q	0	3

*Upper case = large seta, Lower case = small seta, Underlined = ciliate seta.

TABLE 2. Measurements (in mm) of *Pseudosinella lahainensis*, new species

Locality	Antennal Segments				Cephalic Diagnonal	Hind tibiotarsus	Hind claw		Furcula	
	1	2	3	4			unguis	EA	Manub.	Dens
MAUI:										
Lahaina	.047	.087	.072	.142	.206	.167	.022	.015	.211	.189
Lahaina	–	–	–	–	.244	.209	.027	.019	.242	.209
Lahaina	–	–	–	–	.200	.167	.021	.014	.203	.153
Lahaina	.044	.068	.065	.124	.228	.130	.020	.013	.180	.167
Lahaina	.050	–	–	–	.313	.203	.027	.020	.270	.217
Lahaina	.046	.076	.058	.128	.222	–	–	–	.178	.153
Lahaina	.033	.050	.047	.093	.170	–	–	–	.125	.120
Lahaina	.041	.076	–	–	.278	.167	.019	.013	.209	.180
HAWAII:										
Hilo	.055	.104	–	–	.264	.217	.030	.022	.250	.214
Hilo	.044	.104	.076	.179	.272	.217	.031	.022	.245	.220
Keokea Beach Park	.033	.065	.065	.136	.150	.161	.020	.015	.184	.164
Keokea Beach Park	.050	.093	.076	.154	.228	.192	.022	.014	.195	.175



FIGURES 1–8 of type specimens of *Pseudosinella lahainaensis:* 1. habitus; 2. labial triangle; 3. dorsal chaetotaxy of left side of fourth abdominal segment; 4. right eyepatch, 5. hind foot complex; 6. second abdominal segment, dorsal chaetotaxy of left side; 7. manubrial plaque; 8. mucro.

Cephalic, thoracic, and abdominal chaetotaxy as described in Table 1. Scales hyaline, oval to circular, and absent from antennae, femora, and tibiotarsi. Ventral tube with 7–9 smooth setae on each distolateral patch. Trochanteral organ with 4–6 setae per arm. Hind tibiotarsi (Fig. 6) with inner differentiated ciliate macrochaeta acuminate, about ⅓ of the distance from base to apex and about 1.3× as long as largest neighboring setae. Tenent hair acuminate, shorter than inner edge of unguis. Unguis slender with no inner teeth but 2 prominent basal lateral teeth. Unguiculus, excavate, acuminate with a small to moderate wing tooth. Manubrial plaque (Fig. 7) with 2 inner and 2 outer ciliate setae. Dens without basal tubercle or spine-like setae. Mucronal teeth subequal (Fig. 8), with basal spine just attaining apex of anteapical tooth. Maximum length 1.3 mm. Species formula: (see Christiansen, Gama, and Bellinger 1983) 4121125. Typical Gisin formula: R001/00/0120+1,-aBq$_1$q$_2$, 0M0EL$_1$L$_2$.

Remarks — This species is similar to *P. fujiokai* in many respects, but the two differ in that *P. fujiokai* is eyeless and has a lateral posterior macrochaeta on the 4th abdominal segment which is absent on *lahainaensis*. This species shares with *P. fujiokai* the peculiarity of a single M seta on the fourth abdominal segment, although *P. fujiokai* is variable and sometimes has two M seta. *P. biunguiculata*, another similar species, differs in that it is eyeless and has 0+2 fourth abdominal segment dorsal macrochaetae.

In *P. lahainaensis*, the cephalic R setae are somewhat hard to distinguish since they are in line with the antennal base setae. One specimen showed a unilateral S cephalic seta.

This distinctive species shows some marine littoral adaptations in the unguis and unguiculus; the foot structure is very similar to such widely divergent littoral forms as *Isotoma boneti, Archisotoma besselsi, Lepidosira anomala,* and *Mesentotoma* (see Christiansen 1961) and is quite different from all other epigeic members of the genus. Small dental papillae were seen in one specimen, but were apparently absent in all others.

Localities — HAWAII, U.S.A.: (Type locality) *Maui:* Under rocks near high tide mark, Lahaina seashore, 5 February 1982, K.A. Christiansen. *Hawaii:* Rocky shore near Uncle Billy's Hotel, Banyan Road, Hilo, 19 January 1982, K.A. Christiansen; Below sea wall near high tide mark, Keokea Beach Park, 21 January 1982, K.A. Christiansen.

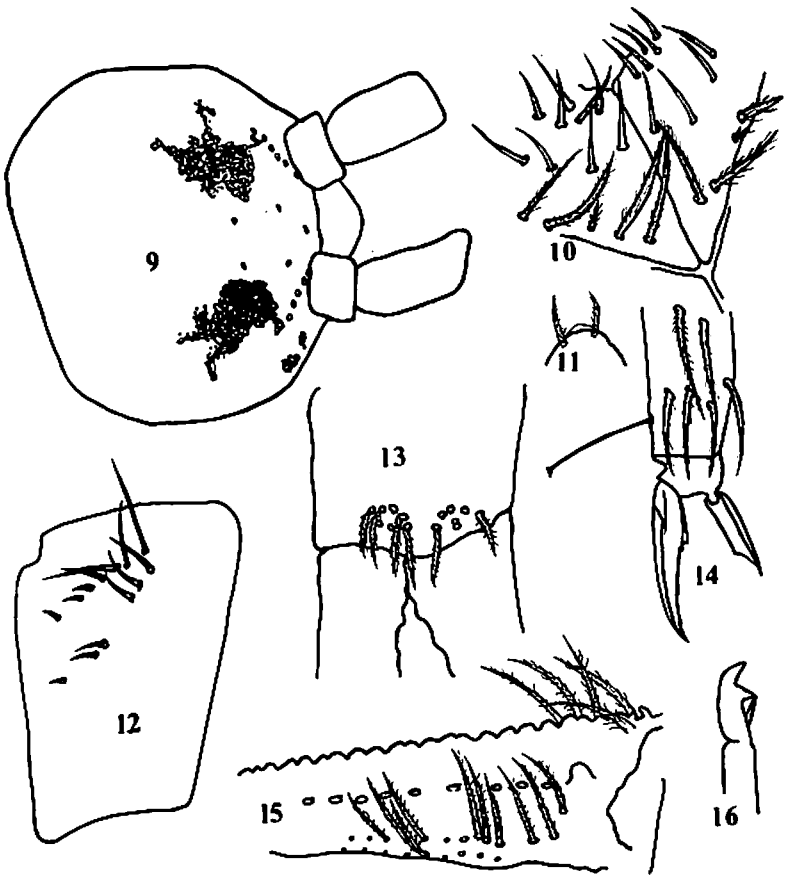
Pseudosinella kalalauensis n. sp.

Figures 9–16 and Table 3

Description — Color white with blue pigment on antennae, eye patches, and between eyes. Fourth antennal segment without apical bulb, and ovoid in shape. Subapical sense peg minute — slightly swollen apically and in a deep pit from which it barely protrudes. Third antennal segment almost triangular, with broad end facing fourth segment. Second and first antennal segments subcylindrical. 4 eyes per side. Head (Fig. 9) roughly pentagonal. Prelabral setae 4–5–5–4 with only posterior row ciliated. Cephalic, thoracic, and abdominal cheatotaxy as shown in Table 1. Scales hyaline, oval to circular, and absent from antennae, femora, and tibiotarsi. Ventral tube with 8–10 smooth to serrate setae on each distolateral patch. Trochanteral organ (Fig. 12) with 6–7 setae per arm. Hind tibiotarsus (Fig. 14) with differentiated ciliate macrochaeta about 1/6 way from base to apex of segment and about 1.3× as long as largest neighboring setae. Tenent hair strongly clavate, subequal in length to inner edge of unguis. Unguis with 3 inner and 2 lateral teeth. Unguiculus truncate and lacking wing tooth. Manubrial plaque (Fig. 13) with 2 inner and 2 or 3 outer setae. Dens (Fig. 15) without spine-like setae but with a weak inner basal hump or knob.

TABLE 3. Measurements (in mm) of *Pseudosinella kalalauensis*, new species

	Antennal Segments				Cephalic	Hind	Hind claw		Furcula	
Locality	1	2	3	4	Diagnonal	tibiotarsus	unguis	EA	Manub.	Dens
KAUAI:										
Kalalau Valley	.026	.060	.046	.133	.189	.145	.018	.013	.181	.153
Kalalau Valley	.028	.081	–	–	.222	.178	.021	.015	.217	.175
Kalalau Valley	–	.076	.050	.123	.236	.175	.020	.013	.200	.181



FIGURES 9–16 of type specimens of *Pseudosinella kalalauensis*: 9. dorsum of head; 10. base of labial triangle; 11. apex of antenna; 12. tocheanteral organ; 13. manubrial plaque; 14. hind foot complex; 15. base of dens; 16. mucro.

Mucronal teeth subequal (Fig. 16), with basal spine just exceeding apex of anteapical tooth. Maximum length 1.1 mm. Species formula (op. cit.): 4211214. Typical Gisin formula: R111/00/0020+3,-abq$_1$q$_2$,M$_1$M$_2$rEL$_1$L$_2$.

Remarks — Similar species include the North American *P. argentea* and *P. collina*. *P. argentea* differs from this species in the absence of eyes, and the fourth abdominal chaetotaxy. *P. collina* differs by having 6 eyes per side and 0+2 fourth abdominal segment chaetotaxy.

Some specimens have a bulge at the antennal apex which approaches the form of the apical antennal bulb.

This species is very similar to *Lepidocyrtus heterophthalmus*, and at first it was thought to be a variant of that species; however, in addition to the difference in eye number, *P. kalalauensis* lacks the setae anterior to the outer bothriotrichia of the second abdominal segment.

Localities — HAWAII, U.S.A.: (Type locality) Kauai: 1.5 mi. from head of Waikanaloa Trail to Kalalau Valley, beaten from understory vegetation in wet forest, 10 February 1982, 500 m. K.A. Christiansen.

Disposition of Types

The types will be deposited in the Bernice P. Bishop Museum, Honolulu, Hawaii.

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